B Physics at the Tevatron (BTeV) Project

Progress Report No. 1
August 1-31, 2004
(M. Lindgren - Editor)
(BTeV-3576)

I. PROJECT DESCRIPTION

The BTeV Project provides for the construction and fabrication of the BTeV detector and installing it in the C0 Collision Hall and Counting Room in a state ready to take data and to provide it with a source of high luminosity proton-antiproton collisions in the C0 Interaction Region. The detector, a forward spectrometer, covers the forward rapidity region with respect to the antiproton beam. The detector will permit the experimenters to study the decays of produced particles containing b-quarks and charm quarks to search for Charge Parity (CP) violation, mixing and other rare processes. The ultimate goal is to find physics that is not described by the Standard Model description of these processes and therefore represents new physics beyond the Standard Model. The key areas where BTeV excels are in the ability to study decays of the B_s meson and to study decays of B mesons and baryons that contain photons and π^o's in the final state. Achievement of the necessary sensitivity requires modifications to the accelerator to produce high luminosity at the C0 Interaction Region.

II. OVERVIEW OF PROJECT STATUS – M. Lindgren

The BTeV project continues to make good progress towards baselining and the beginning of construction. Overall, management continues to forecast the beginning of commissioning with protons as early as December 2009.

There were no injuries on the BTeV project this month.

More detailed information on the project's progress and status this month follows in the rest of this report.

III. MASTER SCHEDULE AND FUNDING SUMMARY

The project continued to work to develop a master WBS Openplan file. The focus for the month was on rationalizing and eliminating errors from the existing subproject files.

V. NARRATIVE HIGHLIGHTS

MANAGEMENT HIGHLIGHTS – M. Lindgren

Change requests – While not a requirement at this stage of the project, there were two PCR's that were requested, submitted, reviewed, and approved this summer. The first was a change in the IR Lattice accomplished by moving beamline elements. The change was presented to the L3 CCB and approved. The second was a level 4 change request from the trigger group (WBS 1.8). The change to commercial microprocessors and switches reduces cost and schedule risk, so was approved. In addition the project was the subject of an internal review of the performance management system. The results of that review are being incorporated into the system.

BTeV DETECTORS (WBS 1.0) – M. Lindgren

Overview

There are no statistics for the production status at the end of the month yet, as no items are yet in production. Most groups are continuing R&D efforts, highlighted by a large effort at the FNAL Test beam facility, which is reported on below in the subproject narratives.

BTeV Magnets, Toroids, Beampipes (WBS 1.1) – C. Brown

Overview

This subproject, to construct the Vertex Magnet, the Muon Toroids, and the BTeV spectrometer Beam Pipes is currently in the pre-construction conceptual design stage.

WBS Level 3 Narratives

Pre-construction conceptual design engineering continues on the details of the Vertex Magnet rollers and the Muon Toroid/Compensating Dipole interface. No pre-construction conceptual design engineering has been devoted to the Beam Pipe design this month.

Administrative / Project Management

The subproject manger continues to interact with the engineering group on the conceptual design and with the other subprojects through discussions with the Project Manager and also by attendance at the weekly Technical Board meetings..

Milestones for the next six months

This subproject is currently on schedule to finish the conceptual design of the Vertex Magnet, Toroid Magnets and Beam Pipe by April 1, 2005, in accord with the Open Plan WBS1.1 schedule, although there is no explicit milestone associated with this completion. No other work is scheduled in the next six months.

Resources

In August 2004, two mechanical engineers, Ed Chi and Bob Wands, and the subproject manager, Chuck Brown, devoted some of their effort to WBS1.1 conceptual design.

BTeV Pixel Detector(WBS 1.2) – S. Kwan

Overview

We finished the phase 1 of the 2004 test beam run on August 23. The new pixel telescope was successfully commissioned during this time. We have also tested 3 single chip hybrid assemblies using the FPIX2 readout chip and the new TESLA sensors.

The RD program continued to make progress on all areas. We have almost finished our goals for this year on sensor and detector hybridization. This puts us in a strong position to start the preparation for preproduction as soon as we get funding for next fiscal year.

On the readout electronics, we have un-covered a small problem on the operation. After extensive tests and simulation, we are confident that we will be on track to have an engineering run of the pixel readout chip in the spring of 2005. We have also successfully assembled and tested the first 5-chip module using the FPIX2 chips.

We have also made some progress on the mechanical design. A lot of effort has been focused on the substrate testing, carbon fiber support studies, and position sensors testing.

WBS Level 3 Narratives

1.2.1 - Sensor and Detector Hybridization

1.2.1.1 Sensor prototypes
The TESLA moderated p-spray sensors have been bump-bonded to the FPIX2 readout chips using two different technologies. Three of the single chip detectors have been tested in the test beam. All together, we bench-tested 6 single chip detectors and one five-chip module. Using a radioactive source, we have determined that the yield is better than 99.95%. This is the first time that we have thinned the readout chips to our specified thickness, 200 microns.

1.2.1.4 Hybridization prototypes
All delivered modules were X-rayed to check for any bump defects. We inspected 60 chips and found no missing or displaced, deformed or shorted bumps. The tool is available and will be used as a means of QA during production.

1.2.2 - Electronics

1.2.2.1 Pixel Readout Chips
We uncovered a problem with the FPIX2 chip which was related to the relative timing between the BCO clock and the arrival of the signal pulse. A systematic test was carried out and the information was provided to the ASIC designers who subsequently verified the fault in the logic and came up with a solution. In the meantime, with a change in the operation, we took lots of test beam data using the FPIX2 chips. We also had discussion sessions with the ASIC designers on the next steps and the timeline. A to-do list was generated and agreed upon. The pixel chip shares the same backend with the silicon strip readout chip (FSSR) and the same designers will work on both chips. At this point, the designers projected a target submission date for the engineering run of around late January to mid-February.

1.2.2.2 HDI & Pixel Module Development
The first 5-chip FPIX2 module was assembled and tested successfully in the lab.

1.2.2.4 PIFC prototype
After extensive discussion and prototyping, we have now a good design of the HDI-PIFC connection. We will use wire bonds. The next step is to lay out the new design and procure a small quantity for test.

1.2.2.9 Feedthrough board
We received the first mechanical prototype of the feedthrough boards. These will be tested in a vacuum. These boards failed the electrical test and the vendors will produce another batch of boards. Because of the difficulty of producing such boards (large size and multi-layers), the electronics team in CD has re-designed the board. A new specification document was prepared and reviewed. This new design is currently being lay-out.

Mechanical Support, Vacuum, and cooling
1.2.3.2 Substrate
More FEA has been done on the substrate and various properties such as thermal performance, thermal stresses etc have been studied. We have found a new vendor and are waiting for a quote from them. We have also held discussions with our existing TPG substrate vendor (GE Advanced Ceramics) on QA issues. Because of the difficulty of producing long pieces of TPG, we have changed our design to have a shorter piece of TPG which will be laminated with carbon fibers and PGS. The connection to the heat sink will be done by two short TPG pieces.

1.2.3.7 Vacuum system
We had more discussion on the option of using Titanium Sublimation Pumps (TSP). A TSP has been ordered and we will do tests to verify its performance. We have also ordered a new turbopump for our outgassing studies.

1.2.3.5 Pixel Plane Position Control System
We had a technical presentation from PI, a German company specialized in piezo-electric actuators. An RD proposal was prepared by the company. A piezoelectric actuator has been ordered. We will study the performance of the actuator in a radiation environment.

1.2.3.8 Substrate Support structure
The Frascati team finished their test to monitor the stability of our prototype carbon fiber support structure using Fiber Bragg Grating (FBG). We have uncovered a problem with stability of our current support structure. A new design has been prepared to address this issue. A new carbon support structure is currently being made in Lab 3.

System Integration and Test
1.2.4.3 Station assembly and testing
We continued our discussion with CKM on getting a KTeV spool piece for our system demonstrator test next year. If we were to design and procure a new vessel for the test, that'd cost us more than $50K. After a few rounds
of discussion, we have been offered a prototype RICH vessel. This may work for us with minor modifications.

1.2.4.5 Test Beam

We have successfully commissioned the new FPIX1 6-plane pixel telescope. We tested three FPIX2 single chip detectors in the test beam under various conditions such as angle of incidence, operating temperature, HV bias of the sensor, LV setting of the chip, threshold setting, and different ADC settings. All together, we have collected about 200 runs of data. Each run varies in size from 100K events to 2 million events.

Administrative / Project Management

We had a Director's Performance Management Review on August 10-11.
We continued our preparation for the upcoming CD2/3a review.
We have continued our discussion with university collaborators on preparing MOU's and SOWs for next year.
We are also working with some university collaborators on their funding request for next year.

Personnel

August is a slow month because of vacations and a lot of the technical staff has been drafted to fix the Tevatron during the summer shutdown. We have lost two full time mechanical engineers this spring. For the time being, a mechanical engineer has been assigned at the level of 50-60% to work on the pixel project. Our electronic engineering manpower remains low. We lost two EEs (CD) since last August and a new hire started working this month. He would not be working directly on the pixel detector.

Milestones

We are on target to have the engineering run of the pixel readout chip next March. However, the ASIC team has to put this as their top priority for the next 6 months in order for this to happen.

Ring Imaging Cherenkov (WBS 1.3) – M. Artuso, T. Skwarnicki

Overview

Accomplishments during the last month:

1. Refinement of the WBS 1.3 cost and schedule estimates, more BOE and documentation.
2. Start new iteration in ASIC development: improvement in MaPMT readout electronics upon test beam experience and tuning of ASIC parameters for PMT readout.
3. Started design and RFQ for components for liquid radiator beam test
4. GAS RICH test beam data analysis
5. Reflectance measurement set-up to be used with small CMA prototype mirror that will be delivered soon.
6. Material compatibility test of the chosen gas started.

Plans in the next 6 months:

1. Implement the ASIC development described above

2. Complete the MaPMT test beam
3. Develop the liquid radiator prototype
4. Design all the test stations and start implementing them
5. Test the prototype CMA mirror and plan the next round of mirror R&D
6. Improve the mechanical design

Electromagnetic Calorimeter (WBS 1.4) – Y. Kubota.

Overview

1.4.1 - Detector - PWO Crystals

In the past, we tested radiation tolerance of our third vendor, Northern Crystals (Apatity) using their ALICE-sized crystals and found that they are adequately radiation tolerant. However, when CMS ordered 5 crystals of CMS endcap size in May, and three were given to our IHEP collaborators, they found out that these crystals were significantly more radiation sensitive (lost up to 50% of light after being irradiated at 100 rad/hour for 70 hours.) The vendor and IHEP physicists worked on an improvement project over the summer. Initially, the vendor made small crystals with different growing conditions, which included doping materials, ingot materials (platinum vs iridium), and purification levels of raw materials. Subsequently, the IHEP collaborators measured the radiation sensitivities of these small crystals to choose what parameters are important to control to produce good crystals. After this study, Apatity has produced 9 new BTeV size crystals with new parameters, and they have been tested at IHEP. They lost at most 30% of their light output, which is comparable to those crystals from Bogoroditsk and Shanghai Institute of Ceramics, and are acceptable to the BTeV use.

The facility used for the above study is a good prototype of the facility we must build to test the production crystals for their radiation tolerance.

1.4.3 - EMCAL Electronics and Associated Infrastructure

QIE prototype chip submission using CMP 4" multi-project wafers will go ahead in Oct. PO has been sent out. Expect chips by the end of the year.

Milestones

Milestones in the recent past and in the next 6 months tell us that many activities are scheduled prematurely in terms of the needs of their results, and readiness due to R&D work leading up to these milestones.

Milestones which OP says we should have met in the recent past are in the table below.

1.4.2.1.3.4	T4M: PMT Final Spec Ready	9-Aug-04
1.4.2.1.4.3	T4M: Final PMT QA Procedures Ready	30-Aug-04
1.4.2.2.2.6	T5M: PMT Bases Prototype Tested	4-Mar-04
1.4.2.3.1.5	T4M: PMT-Crystal Gluing Method Ested	6-May-04
1.4.3.1.2.1.12	T4M: TB ADC card is functional	13-May-04

1.4.2.1.3.4 & 1.4.2.1.4.3 We will be ready to test QE and rate dependence, which turned out to be important characteristics of PMT's in the next few months. After a few months of actual testing, we will be able to settle on the semi-final specifications ready by Jan 05. However, since we don't need them until Oct 2006, we may do a larger scale sample testing meantime as time and resources allow.

1.4.2.2.2.6 PMT bases prototype worked well in the testbeam (July-August 2004)

1.4.2.3.1.5 We have already established glues which work well with Quartz and radiation hard. We will not be working on the additional work to establish the final gluing method for a quite a while since we won't need it until Oct 2006

1.4.3.1.2.1.12 Testbeam ADC cards (FEB) started later than the schedule, and is being worked on right now. It is expected to be done by the end of this year.

Milestones in the next 6 months

1.4.1.6.3	T4M: Crystal Final Spec Compl	21-Mar-05
1.4.2.1.4.4.5	T5M: PMT QA set-ups Ready	27-Oct-04
1.4.2.1.4.5	T4M: PMT Related R&D finished	27-Oct-04
1.4.3.2.5.1.2	T5M: First QIE test chip is functional	28-Mar-05
1.4.3.2.5.2.5	T5M: Interface & probe cards are assembled	28-Mar-05
1.4.5.9.1.1.3	T5M: Rvw'd DS RC Reqmts Doc	13-Dec-04
1.4.5.9.1.1.6	T5M: DS RC Reqmts & Specs Doc	28-Feb-05

1.4.1.6.3 Once the current studies at IHEP on the QA procedures using Cs source is make progress based on Nov 2004 test beam runs, we should be close to deciding on the final PWO crystal specifications. Additional test beam runs in April 2005 may delay this decision by a few months. This is not needed until August 2005, when we hope to be able to ask for a quote from SIC.

1.4.2.1.4.4.5 & 1.4.2.1.4.5 are not needed until October 2006. Related to 1.4.2.1.3.4 and 1.4.2.1.4.3 above. Could be finished as early as Jan 2005.

1.4.3.2.5.1.2 On schedule. We awarded PO for Oct 11 MPW run, and expect chips to arrive by the end of the year. Design engineer's testing will be a few months. In the middle of this testing, physicists' testing will start and expected to last until August.

1.4.5.9.1.1.3, 6, requirements and specification documents. There are similar work for other software projects for integration work. These are premature to be worked on in the next 6 months, and should be moved to later date which the framework is laid out by WBS 1.9 people. We must find out what this date will be.

Muon Detector (WBS 1.5) – P. Sheldon

Overview

Work continued on our WBS and schedule.

WBS Level 3 Narratives

1.5.1 - Muon Planks

No planned activity in the Muon WBS.

1.5.2 - Muon Quads

No planned activity in the Muon WBS.

The University of Illinois is working on assembling a full size prototype of a muon sensor plane wheel. Parts have been ordered and started to arrive this month. The Illinois group evaluated these parts and found that some had to be redesigned or remade before the prototype could be assembled. They parts have been made in the Vanderbilt machine shop and at a machine shop in Champaign (Harlan and Lash).

1.5.3 - Muon Electronics

No planned activity in the Muon WBS.

1.5.4 - Muon Test Stands

No planned activity in the Muon WBS.

Work continued on tension and HV plank test stands. This month we finished the design of a new control board for the tension measurement stand which also includes inputs and control for the HV test. We have ordered the boards from a fabrication shop and are waiting for their arrival.

1.5.5 - Muon Gas System

No planned activity in the Muon WBS.

1.5.6 - Muon Software

No planned activity in the Muon WBS.

1.5.8 - Muon Subproject Management

No planned activity in the Muon WBS.

Milestones for the next six months: None.

Physicist, engineering, drafting, technician, installation team, and survey resources are currently at their planned levels. In particular, sufficient physicist, engineer, technician, postdoc, graduate student, and undergraduate student labor exists at all three university sites. We will need to start to ramp up our labor in April of 2005. At that time we will need to add one full time technician

at Vanderbilt. Undergraduate labor and further part-time technician labor will need to be added this summer at all sites.

Forward Straw Tracker (WBS 1.6) – A. Hahn.

Overview

The month of August is a typical "slow" month due to vacations. We are finishing up on the pre-conceptual activities in anticipation of FY05. Major efforts for the month have been in support of the Reviews, in particular all Level 3 managers have been assisting in reading the dictionaries and Basis of Estimates, as well as assuming ownership of their own sections.

WBS Level 3 Narratives

1.6.1 –Straw Chambers- Level 3 Manager: John Krider

1.6.1.4.1.1.2 - Design/Prototype Straw (FNAL)
Assembled and mounted a single 4 mm straw for comparison to an existing 8 mm straw. Plateau tests show an 8 mm straw behaves comparably to one of our "standard" 4mm straws with respect to drift speeds and gas gain (BTeV doc. # 3384). Fabricated and documented a holder for the new Ru106 radioactive source to be used in Straw prototyping. Procured components and began setting up for study of a controlled nitrogen leak to help in setting leak requirements for Straws

1.6.1.3.5 - Engineering Prototype Detector (FNAL)
We fabricated another carbon fiber strut for the current frame. Procured material and submitted the job to lab 8 to finish parts for module gluing fixture.

1.6.1.5.6.1-Wire Tension Measurement Tool Preproduction (SMU)
A method to measure the tension of the anode wire (after stringing) has been tested which is an order of magnitude faster than the original approach. This is an important achievement if we hope to keep up production at the Half-View Assembly sites. BTeV doc # 3386

1.6.1.8.1 - Preconceptual R&D on Mod#0 and 1 (Frascati)
Prototypes of the M0X module have been built and are in process of being tested, in anticipation of a FNAL Test beam run in Feb. 2005.

1.6.2-Straw Detector Electronics- Level 3 Manager: Walter Stuermer

1.6.2.3.2.4 TDC ASIC R&D (FNAL)
Ahmed Boubekeur is taking a bottom up approach towards the design of our first prototype TDC chip. His first priority is to devise a working layout for the multiplying DLL that is used to make a 1.45ns TDC clock. This is considered the "analog" part of design. Ahmed is working to make a design will work with variations in process, temperature, supply voltages.

1.6.2.2.2 Preamp/Discriminator Board (PDB) (UVa)

Testing of the Preamp/Discriminator Board is ongoing.
The University of Virginia has identified a person who will assist Harry Powell in the layout of the next PDB prototype cards.

1.6.2.3.2.2 Communications Interface Test (FNAL)
W. Stuermer has prepared a first draft of the requirements document for the communications interface test. Preliminary work has started in the design of a test board based upon the (Computing Division) PCI Test Adaptor ("PTA") board. Allan Prosser, who is going to be designing the DCB and I are reviewing the proposed front end interface, looking for necessary clarifications and for logical problems.

1.6.3-Mechanical, Gas, Calibration –Level 3 Manager: Dan Olis

1.6.3.1- Chamber Aging Research

UVa- Studies are beginning on the aging studies of Copperized Straws.
UH- Aging studies now show that the principle contaminant found of Anode Wires aged to ~2C/cm is Silicon. We are looking for the sources of this contamination. BTeV doc # 3392
UH-SMU-UVa- Work is continuing on a proposal to measure the aging effects in a Hadron Beam.

1.6.4—Integration and Testing-Level 3 Manager: Penny Kasper

1.6.4.1.1 - Prototype Test Beam Studies
FNAL - Removed the upstream Fenker chamber and begin repair of a broken wire. Maintained gases for the detectors. Began planning for M0X installation for February 2005 Test Beam run.
UVa - Analysis of Test Beam data continues as we try to understand the source of the less than optimal resolution measured in the Test Beam Run.

1.6.4.1.6.1- Physicist Support (Simulations) of Straw Detector (UVa)
Work has begun on inputing the Straw Detector Geometry into Geant 4.

Administrative / Project Management

1.6.5—Forward Tracker Straw Detector Subproject Management

1.6.5.1.1 - Pre-Conceptual Phase Management
Helped update the WBS dictionary (L3 Managers)
Prepared for upcoming Temple Lehman Reviews

There are no milestones in the next 6 months. This period includes the “turn on” of the project. The major efforts will be to get MOU’s and SOW’s in place so that we can begin to flow resources to our University colleagues. Technical personnel are in place at FNAL to handle the next 6 months of work. This work is primarily design work, so we are not affected in a major way (this year) by the Accelerator Shutdown. However, the Fermilab scientific personnel currently working on project is ~1 FTE, after management efforts and other BTeV commitments are subtracted from the 2 staff members we have. It will be challenging to get technical personnel (engineers, designers, and technicians) at

the Universities during the next 6 months due to the funding profile. We assume these tasks can be covered, at least initially, by the existing scientific staff, with the assistance of the Fermilab technical personnel.

Forward Silicon Microstrips (WBS 1.7) – L. Moroni

Overview

The activity in this phase of the project is concentrated on the construction of the final prototype of a micro-strip ladder, which will be tested around the end of 2005 to validate all the techniques and, thus, to proceed to the next Pre-Production phase.
Major activities will be on Pass Two read-out chip, hybrids & flex-cables and inner station mechanics, as it can be deduced from the next six month milestones.

WBS Level 3 Narratives

1.7.1 - Sensors

No WBS activity for sensors was scheduled to occur in August.

1.7.2 - Electronics

1.7.2.1 - IC Readout Chips
No activity was scheduled for August 04 on the read-out chip development. Nevertheless, because of the availability of personnel in Pavia, we decided to anticipate the simulation work for Pass Two IC, which was originally scheduled for October 04. This should allow us to reduce the time needed to reach the first milestone, i.e. 1.7.2.1.3.1.1.8 (T5M: Pass Two IC Schematics, Simulations, Layout).

1.7.2.2 & 1.7.2.3 – Hybrids and Flex cables

In August, at SiDet, we started the assembly of a pre-prototype ladder to test the preliminary versions of the hybrids and flex cables, which will be delivered by the end of September.

1.7.3 – Mechanics and Cooling

We have practically defined with PLYFORM all the Reqs and Specs for the inner station mechanic prototype. We are pretty close to reach the first foreseen milestone for this subproject, i.e. 1.7.3.1.1.3 (T5M: STMEC Reqmts & Prel Specs Documents Revwd & App).

1.7.4 – Integration

No integration activities were scheduled this month.

Administrative / Project Management

We are on schedule on all the subprojects.
The Milestones for the next six months are listed in the following table.

Activity ID	Activity Description	Early Start
1.7.2.1.3.1.1.8	T5M: Pass Two IC Schematics, Simulations, Layout	12Jan05
1.7.2.1.3.1.2.4	T5M: Pass Two IC Proto RFPs Revwd & Apprvd	04Feb05
1.7.2.2.2.4	T5M: Updated Hybrid Specs Doc Revwd & App	25Oct04
1.7.2.3.1.2.4	T5M: Updated Flex Specs Doc Revwd & App	28Oct04
1.7.2.3.1.2.11	T4M: Flex Vend Sel Revwd & Apprvd	04Feb05
1.7.2.3.2.1.3	T5M: Bias Flex Reqmts Document Revwd & App	14Oct04
1.7.2.3.2.1.6	T5M: Bias Flex Prel Specs Documents Revwd	26Oct04
1.7.2.3.2.1.11	T5M: Bias Flex Perfance Revwd & App	21Dec04
1.7.2.3.2.2.4	T5M: Bias Flex Final Specs Document Revwd & App	13Jan05
1.7.3.1.1.3	T5M: STMEC Reqmts & Prel Specs Documents Revwd & App	03Dec04
1.7.4.3.2.1.5	T5M: MSRC Test Stand Des & Test Results Apprvd	23Dec04

Trigger (WBS 1.8) – E. Gottschalk

Overview

The monthly report for August, 2004 for WBS 1.8 includes work on the L1 pixel trigger, L1 muon trigger, L2/3 software, and L2/3 hardware.

For the L1 pixel trigger we met with vendors IBM and Apple to learn more about their PowerPC processor products. For IBM the discussion focused on their blade servers, customization that they offer for their blade servers, and PowerPC processor roadmap. The IBM roadmap is compatible with the projections that we are making for processor performance in our WBS. Discussions with Apple dealt with their G5 Xserves.

We continued with a low-level of activity on the development of the FPGA segment tracker, and discussed possible changes in the architecture of the L1 pixel trigger.

For the L1 muon trigger we modified the trigger algorithm, which was developed to run on a Texas Instruments DSP, to run on Apple G5 Xserves and Intel processors. The modified code was used to determine benchmarks for these processors, and results were used to modify the WBS and Technical Design Report.

For L2/3 software we studied pixel detector alignment methods. The alignment of the pixel detector relies on mechanical sensors and verification of alignment using charged-particle tracking. In addition to using tracks that come from the interaction point, we studied the use of high momentum tracks coming from the interaction of the beam halo with a wire target located approximately 12 meters

upstream of the interaction point. The studies were performed with a prototype of the new Geant4-based BTeV simulation package. We also worked on the package itself, and implementation of the current pixel geometry.

For L2/3 hardware we completed the assembly of the 33-node prototype L2/3 PC farm, which will be used for the RTES Super Computing 2004 demonstration system. The farm consists of 31 worker nodes, one data-server PC, and one manager PC. The installation was started in June. At the beginning of August some work on the farm was done by an RTES summer high school teacher, and summer high school student. Completion of the monitoring software installation was done, as well as setting up the farm in a manner that makes it more manageable using scripts. Moreover, a console server was tested on a small 4-node farm, and work was started on making serial cables and adapters that were purchased in August.

Event Readout and Control (WBS 1.9) – K. Honscheid, M. Votava

Overview

We have no milestones in the next 6 months. All ongoing work is in project management in preparation for upcoming reviews with a .5 FTE Computing Division effort. Technical work in WBS1.9 officially begins in November, 2004 with the start of the DCB design. Alan Prosser is the electronics engineer working on the activity and other resources (technicians, software engineer) are expected to be available as needed. Software design begins in January, and we are actively trying to fill an open position to help in this activity.

Integration &Installation (WBS 1.10) – J. Howell

Overview

Joe Howell continues as interim level 2 manager as project management actively seeks to fill the position of Project Integration Physicist.

A good deal of effort has been spent preparing materials for the Director's CD-2/3a review that starts Sept. 28. This effort is applied towards generating the baseline cost and schedule and basis of estimates.

1.10.1 - Installation, Integration, Testing and Commission Planning

The only activity schedule for the following six months is the development of a preliminary set of installation drawings. Information on utility lines that will pass through the assembly hall-to-collision hall penetrations is being collected from the sub-project groups.

1.10.2 - Infrastructure Development + Procurement, Install+Test at C0

No activity has occurred in the past month. The only activity scheduled for the next six months is establish requirements for Alignment Monitoring System.

1.10.3 - Component and Syst Transport, Assembly, Install, and Connect

No activity has occurred in the past month. The first activity is scheduled to begin in 2006

1.10.4 - Multiple Subsys Interconnect and Int +Testing at C0

No activity has occurred in the past month. The first activity is scheduled to begin in 2009

1.10.5 - System Integration and Testing

No activity has occurred in the past month. The first activity is scheduled to begin in 2009

1.10.6 - System Install Integrate Commission Subproject Management

Work continued in revising the Open Plan cost and schedule file.

Administrative / Project Management

There are no milestones within the next six months.

Joe Howell (PPD Engineering) continues at a 60% FTE level. John Rauch (PPD Design/Drafting) continues at a 5% FTE level

C0 Interaction Region (WBS 2) – M. Church

Overview

For all WBS elements the bulk of the effort was spent on establishing and documenting a technical, cost, and schedule baseline for the upcoming CD-2/3a reviews. Design work continued through August on some elements. A minor lattice change was implemented which provided some cost savings. 4.5 FTE's from Accelerator Division and 10.1 FTE's from Technical Division worked on this project in August 2004. Some M&S funds were obligated for travel to vendors and for cryogens for High Temperature Superconductor (HTS) lead tests. All funding was provided as "in kind." No milestones were scheduled for this month, and none were met. There are no milestones scheduled until 4/05.

WBS Level 3 Narratives

2.1 – Magnets

LHC-type Quadrupole Magnets: Final cost estimates for Cold Mass components, Tooling, Cryostat, and Test stand were generated. Expansion loop and bus work design is underway. The assembly drawings for expansion loop are currently being developed. Magnetic and thermal analysis on yoke design has begun. Design of cryostat and test stand components is continuing.

HTS Leads: Cold tests were performed on an existing lead to confirm the operating range. The tests showed that the existing leads could be used for BTeV.

Corrector Magnets: Visited IHEP, Russia and CERN to discuss the details of corrector design, cost and schedule.

Spool Assembly: Initiated preliminary fabrication study with 6 vendors to get feedback on cost and schedule. The design of spool assembly components is continuing.

2.2 - 2005 Shutdown

A 290-line resource-loaded schedule was developed in MS Project for the tunnel installation activities for this shutdown. Design work continued on the Low Conductivity Water (LCW) system modifications required for the 2005 shutdown. Final cost estimates were generated.

2.3 - Power Supplies

Final selection of corrector magnet parameters necessitated switching from 50A power supplies to 100A power supplies. A technical baseline was established for these new supplies and cost estimates readjusted. Final cost estimates were generated.

2.4 - Cryogenic Elements

Design work continued. Old mechanical drawings are being put into 3-D CAD and modified for C0 IR parameters. Final cost estimates were generated.

2.5 - Controls

Final cost estimates were generated.

2.6 - Instrumentation

Baseline design for a new synch light monitor location in the Tevatron was established. Final cost estimates were generated.

2.7 - Separators

Previous cost estimates were reviewed and found satisfactory.

2.8 - 2008 Shutdown

Cryogenic header work was moved out of the 2009 shutdown and into this shutdown. Design of power supply buswork continued. Final cost estimates were generated.

2.9 - 2006 Shutdown

Inactive. There is no work planned for this shutdown.

2.10 - 2007 Shutdown

Design of power supply buswork and LCW continued. Final cost estimates were generated.

2.11 -2009 Shutdown

A 700-line resource-loaded schedule was developed in MS Project for the tunnel installation activities for this shutdown. Final cost estimates were generated.

2.12 – Comissioning

Final cost estimates were generated.

Administrative / Project Management

WBS 2.13: Management and Physics

A formal Project Change Request (PCR) was approved for a lattice change (see btev-doc-3306). The level 2 manager participated in the Director's Project Management System review of 8/11. C0 aperture calculations were repeated and included in the TDR. A study group was assembled to produce a list of Tevatron accident scenarios for BTeV operations (btev-doc-3430). Work proceeded in upgrading the CDR to a TDR. A Memorandum of Understanding (MOU) was written between wbs 2.0, wbs 3.0 and wbs 1.10 outlining the responsibilities and division of labor of each subproject.

C0 Outfitting (WBS 3) – T. Lackowski

Overview

Work continues towards the completion of the Title 1 Report. Drawings, schedules and cost estimates have been updated to incorporate refined high density computing heat loads and an accepted value-engineering proposal. The value engineering proposal eliminated the "Electronics' Bridge" and replaced the square footage with a three story 25' by 25' bay at the northwest corner of the existing C-0 building. Outline specifications have been included in the Title l Report.

Preliminary design has been advanced to substantiate design assumptions made during the Conceptual Design Phase. This work includes refinement of plans, sections and elevations, the development of details and preliminary structural, mechanical and electrical calculations. The majority of this effort has been focused on the C0 Outfitting Phase l part of the project.

The C0 Outfitting Phase 1 work scope has been reviewed by the FESS/ Eng. Construction Managers (Steve Dixon, Elaine McCluskey, Jeff Sims, and Myself) and the FESS environmental

officer (Rod Walton) for ES&H concerns. No major concerns were identified. The project scope has been discussed with the ES&H group (Teri Dykhuis) to determine permit requirements. A preliminary review indicates that no regulatory permits will be required. Shielding assessment drawing have been prepared and forwarded to the Accelerators RSO. Ray Lewis of the Accelerator Safety group has been contacted to provide ODH requirements during construction.

Administrative / Project Management

Anticipating the start of contract documents for C0 Outfitting Phase l to start early January 2005. Project team has been identified. Resources are available for this effort.
Cost and obligation to Aug. 30 is $180,085 ($219,952 burdened)

Project Management (WBS 4) – M. Lindgren.

Overview

The highlight of August was the arrival of our new budget officer, Suzanne Pasek. Suzanne is already making her presence felt in the office, picking up the many tasks that the budget officer is responsible for. In addition the project participated in a Fermilab review of the BTeV performance management system. In this review, the project management was reviewed for the compliance of the EVMS against the 32 DOE order 413.3 criteria for project management systems. The project successfully completed this review, and the closeout report has been the projects guideline for making corrections and changes to the benefit of the existing PMS.

VI. ES&H HIGHLIGHTS

Management Overview

M. Heflin, the BTeV Project ES&H Coordinator provides ES&H support for the Design Phase of the BTeV Project. The primary effort is to provide ES&H support to the Sub-Project managers and task managers for all C0 installation activities. They also provide oversight of the implementation of the T&M and Fixed Price subcontractors' safety programs, which includes concurring with the subcontractor on where improvements are needed and the priority for those improvements. Additional efforts include verifying continuing improvement, hazard analysis review and participation in daily and weekly ES&H Inspections with the C0 Floor Manager and representatives from the DOE Fermi Area Office.

The BTeV Project ES&H Coordinator will chair regular meetings with members of the BTeV project management team to discuss work planning issues, ES&H/QA review updates and issues, hazard analysis issues, training issues, facility safety issues, and general ES&H program issues. We are still in need of filling this position.

ES&H support personnel and BTeV managers for the installation phase of the project will meet on a daily basis to discuss the daily schedule, upcoming tasks, related ES&H requirements,

hazard analysis, ES&H training and other ES&H issues. They also review and plan for upcoming tasks in the schedule.

BTeV Safety Issues

Project Safety Performance

Safety Performance for the BTeV Project for 2004 Calendar Year to Date includes a Recordable Incident Rate of 0**,** a Lost Time Incident Rate of 0.0, and a Lost Workday Incident Rate of 0.0. The Project to Date Safety Performance includes a Recordable Incident Rate of 0, a Lost Time Incident Rate of 0, and a Lost Workday Incident Rate of 0.

VII. LEVEL 3 MILESTONES

There are no project reportable milestones during this period.

VIII. VARIANCE ANALYSIS – M. Lindgren

Variances will be reported after the beginning of the 2005 fiscal year.

IX. COST REPORTS

Cost and earned value reports for the BTeV Project are presented in two sets, one for Total Estimated Cost (TEC), and a second for Other Project Costs (OPC). Information for all segments of the project is summarized at WBS Level 3 except in the case of the OPC CURVE Reports that are at WBS Level 2 instead. The actual cost of work performed (ACWP) is comprised of the following: 1) costs collected and reported by the Fermilab financial system, 2) costs collected and reported to BTeV Project Management by the collaborating institutions. Since the Italian collaborating institutions are not required to report their actual costs to BTeV Project Management, we are assuming that actual current period costs and cumulative costs are equal to current period earned value and cumulative earned value, respectively. Each set of cost and earned value reports includes the following:

CPR Format 1A
This is a modified version of the traditional CPR Format 1 report that shows indirect cost for each WBS Level 3 rather than as a single line item for the entire project. As a result it is possible to review the status of both burdened and unburdened costs for each major system or cost component. In addition, the report for the OPC includes a summary section at the end, with WBS Level 2 totals for the BTeV Detector and Project Support segments of the project.

CPR Format 3
This is the traditional format for reporting changes to the project baseline that were approved and implemented in the current reporting period, as well as their impact on the time phased project baseline.

CURVE Reports
These graphically depict cumulative Budgeted Cost of Work Scheduled (BCWS), Budgeted Cost of Work Performed (BCWP), and Actual Cost of Work Performed (ACWP), at WBS Level 3 and WBS Level 2 for the TEC and OPC, respectively. The OPC reports reflect all project costs, and all amounts shown are fully burdened.

Plan v Act Reports
These reports compare burdened planned costs (BCWS) with burdened actual costs (ACWP) on a cumulative basis through the end of the prior fiscal year, and by month for the current fiscal year. There are two versions of this report, one for total cost, and a second for labor costs only. Both OPC versions represent US Funds only.

BTeV Project Obligations

This report reflects burdened obligations to date, including requisitions in progress, for the entire project, as recorded in the Fermilab financial system. Consequently, it does not include any assumed obligations with respect to work performed by the Italian collaborating institutions.

The BTeV project will produce these reports after the CD-2 baseline review.